CERTIFICATION

Docket No.: M1989-9

I, **Tomohiro Yamazaki**, hereby certify that the attached is a correct literal English translation of Japanese Patent Application No. 11-356060, filed December 15, 1999.

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Date

[Document name] Specification

[Title of invention] Electric vacuum cleaner

[Claims]

[Claim 1]

An electric vacuum cleaner, comprising:

a vacuum cleaner body that internalizes a motorized fan;

a flexible hose that is connected to said vacuum cleaner body;

an extension pipe that is optionally connected to said hose;

a floor suction tool that is connected to said extension pipe;

a circulation path in which exhaust from said motorized fan is circulated to said floor suction tool via said hose and said extension pipe;

a rotation brush and a motor that drives said rotation brush being provided on said floor suction tool;

feeder lines to said motor being placed in said circulation path.

[Claim 2]

An electric vacuum cleaner as described in Claim 1, wherein:

said floor suction tool is constructed from a suction tool body, a pivoting pipe that can be moved up and down with respect to said suction tool body, a connection pipe that can be pivoted in the circumferential direction with respect to said pivoting pipe;

said feeder lines are placed in a circulation path formed on said pivoting pipe and said connection pipe;

said feeder lines have more slack than the pivoting distance of said pivoting pipe and said connection pipe.

[Claim 3]

An electric vacuum cleaner as described in Claim 1, wherein:

exhaust air is guided to said rotation brush in the rotation direction of said rotation brush.

[Detailed description of the invention]

[0001]

[Technical field of the invention]

The present invention relates to an electric vacuum cleaner of an exhaust reflux (circulation) type in which exhaust from a motorized fan internalized in a vacuum cleaner body is circulated to a floor suction tool via hose and pipe.

[0002]

[Prior art]

Japanese Application Number 11-163986 proposes an electric vacuum cleaner, wherein: there is a circulation path in which exhaust from a motorized fan is circulated to a floor suction tool that has a rotatable rotation brush; by blowing the exhaust towards the surface to be cleaned inside the floor suctioning tool and by rotating the rotation brush with the exhaust, dust from the surface to be cleaned is buoyed up and suctioned.

[0003]

However, when cleaning a carpet with long fibers, there may be insufficient rotational torque if the rotational force of the rotation brush is only from the circulated exhaust. The dust deep inside the fibers of the carpet and the like may not be sufficiently removed.

[0004]

In order to solve this problem, there has been considered a construction wherein the floor suction tool is provided with an electric motor that forcibly rotates the rotation brush. However, space for wiring the feeder lines to the motor is needed. If wiring space for feeder lines is provided on a floor suctioning tool with a two layer construction of a air suctioning path and exhaust path, the floor suctioning tool becomes large and it becomes difficult to use.

[0005]

[Problems to be solved by the invention]

Upon considering the above problems, the object of the present invention is to provide an electric vacuum cleaner that simplifies the construction of the floor suction tool and also improves its dust removing performance.

[0006]

[Means for solving the problems]

The first means of the present invention is an electric vacuum cleaner, comprising: a vacuum cleaner body that internalizes a motorized fan; a flexible hose that is connected to the vacuum cleaner body; an extension pipe that is optionally connected to the hose; a floor suction tool that is connected to the extension pipe; a circulation path in which

exhaust from the motorized fan is circulated to the floor suction tool via the hose and the extension pipe; a rotation brush and a motor that drives the rotation brush being provided on the floor suction tool; feeder lines to the motor being placed in the circulation path.

[0007]

In the first means of the present invention, preferably, the floor suction tool is constructed from a suction tool body, a pivoting pipe that can be moved up and down with respect to the suction tool body, a connection pipe that can be pivoted in the circumferential direction with respect to the pivoting pipe; and the feeder lines are placed in the circulation path formed on the pivoting pipe and the connection pipe; and the feeder lines have more slack than the pivoting distance of the pivoting pipe and the connection pipe.

[0008]

In the first means of the present invention, preferably, the exhaust air is guided to the rotation brush in the rotation direction of the rotation brush.

[0009]

[Embodiments of the invention]

Referring to the figures, an embodiment of the present invention will be described in detail.

[0010]

A vacuum cleaner body 1 is constructed from a body case 2, a cover 16 (described later) that is attached to the outside bottom part of body case 2 and forms an exhaust path 17 between it and body case 2, a front cover 18 (described later) that is attached to the

front part of body case 2. Vacuum cleaner body 1 has a suction opening 3 on the front wall of body case 2. Going in order starting from the front of body case 2, vacuum cleaner body 1 is equipped with a dust collecting chamber 5 that internalizes a paper pack 4 connecting to suction opening 3, a motorized fan chamber 7 that internalizes a motorized fan 6, a cord reel chamber 9 that internalizes a cord reel 8.

[0011]

Motorized fan 6 is covered by a motor cover 10. A first opening 11 at a position corresponding to the fan of motorized fan 6 and a second opening 12 at a position corresponding to the motor for motorized fan 6 are formed on motor cover 10. A filter 13 is placed on second opening 12. After passing through the motor, a portion of the exhaust from motorized fan 6 is discharged via filter 13 from the axle portion of a wheel 14 placed on the side of body case 2.

[0012]

Return opening 15 is formed on the bottom surface of motorized fan housing chamber 7 and is corresponding first opening 11 of motor cover 10 that covers motorized fan 6. A portion of the exhaust from motorized fan 6 is guided via return opening 15 to exhaust path 17.

[0013]

Cover 16 is attached to the outside bottom surface of body case 2. Exhaust path 17, through which exhaust from motorized fan 6 passes, is formed between cover 16 and the bottom surface of body case 2.

[0014]

Front cover 18 is attached to the front part of body case 2, and between it and body case 2, an exhaust space 19 is formed. There is formed a hose connection tube part 20 into which a first connection member 27 of a hose 24 described later is inserted. The opening for hose connection tube part 20 coincides with suction opening 3 of body case 2. A communication opening 21 is formed on a part of hose connection tube part 20 and connects exhaust space 19 and the inside of hose connection tube part 20.

[0015]

A partitioning wall 22 is formed facing forward on the bottom part of the front wall of body case 2. Partitioning wall 22 partitions exhaust path 17 and exhaust space 19. In addition, exhaust path 17 and exhaust space 19 are connected by a communication hole 23 formed on partitioning wall 22.

[0016]

Hose 24 is removably connected to one end of vacuum cleaner body 1. Hose 24 has a two layer construction of a smaller diameter inner hose 25 that has flexibility and an outer hose 26 that has a larger diameter than inner hose 25. The inside of inner hose 25 is the suction path, and between inner hose 25 and outer hose 26 is the exhaust path. A coil wire that is conductive and is automorphic is embedded in outer hose 26.

[0017]

With regard to hose 24, coil wires and the like are not embedded inside inner hose 25. Even if the user accidentally steps on hose 24, any deformation of inner hose 25 is restored, and as long as outer hose 26 is not deformed, inner hose 25 is not deformed. Therefore, dust does not become clogged inside inner hose 25. Furthermore, if outer hose

26 is deformed, it is recognized that inner hose 25 is also crushed. Problems of not noticing irregularities with inner hose 25 and inner hose 25 becoming clogged is prevented.

[0018]

Furthermore, with hose 24 in the present embodiment, inner hose 25 is of a colored resin material, and outer hose 26 is formed of a semi-transparent resin.

[0019]

A first connection member 27 is placed on one end of hose 24. First connection member 27 is constructed from an inner 28 member to which inner hose 25 is connected, and an outer member 29 to which outer hose 26 is connected. After attaching inner hose 25 to inner member 28, outer hose 26 is attached and secured to outer member 29.

[0020]

First connection member 27 is formed so that inner member 28 protrudes out more than outer member 29. When first connection member 27 is connected to hose connection tube part 20 formed on front cover 18 of vacuum cleaner body 1, there is an airtight connection of inner member 28 with suction opening 3 of body case 2. In addition, communication opening 21 formed on hose connection tube part 20 is opposite inner member 28 which protrudes more than outer member 29. Exhaust from exhaust space 19 flows between inner member 28 and outer member 29 of first connection member 27 via communication opening 21.

[0021]

A second connection member 30 is placed at the other end of hose 24. As with first connection member 27, second connection member 30 is constructed from an inner member 31 that connects with inner hose 25 and an outer member 32 that connects with outer hose 26.

[0022]

A grip part 34 is formed unitarily on the upper surface of handle pipe 33. Second connection member 30, onto which hose 24 is connected, is rotationally and electrically connected to handle pipe 33. Handle pipe 33 is constructed from the following: an inner tubular part 35 that has an approximately circular cross section and coincides with inner member 31 of second connection member 30 and forms the suction path; and an outer tubular part 36 that is formed covering the under side (opposite side from grip part 34) of inner tubular part 35 and is in communication with outer member 32 of second connection member 30 and forms the exhaust path.

[0023]

A clamp 37 is embedded on handle pipe 33 in a see-sawing condition. A pushing part 38 formed on one end of clamp 37 is exposed at the top surface of handle pipe 33. In addition, a hook 39 formed on the other end can be raised and lowered inside inner tubular part 35 via an opening (not shown) formed on inner tubular part 35.

[0024]

A first extension pipe 40 and a second extension pipe 41 are removably attached to handle pipe 33. Corresponding to the shape of handle pipe 33, first extension pipe 40 and second extension pipe 41 are constructed from the following: a suction tube part 42 and

suction tube part 43 that both have an approximately circular cross-section coinciding with inner tubular part 35; and an exhaust tube part 44 and an exhaust tube part 45 that coincide with outer tubular part 36 and have an approximately crescent-shaped cross-section and are formed covering the underside of suction tube part 42, suction tube part 43.

[0025]

On the other end of first extension pipe 40 (on the side connecting with second extension pipe 41), a clamp 46 similar to clamp 37 of handle pipe 33 is placed between first extension pipe 40 and cover 40a that is attached unitarily on the outer surface on the side of suction tube part 42. A pushing part 47 that is formed on one end of clamp 46 is exposed at the upper surface of cover 40a. In addition, a hook 48 formed on the other end can be raised and lowered inside suction tube part 42 via an opening 49 formed on suction tube part 42 of first extension pipe 40.

[0026]

On one end of first extension pipe 40 and second extension pipe 41(on the side connecting with handle tube 33), an insertion tube part 50 and an insertion tube part 51 that are inserted into handle tube 33 and the other end of first extension pipe 41 are formed. A packing seal 52 is placed on the outer perimeter of insertion tube part 50 and insertion tube part 51 of suction tube part 42, suction tube part 43. A latching depression part 53 is formed on the upper surfaces on the side of suction tube part 42, suction tube part 43 of insertion tube part 50, insertion tube part 51. Latching depression part 53 latches with hook 48 of clamp 46.

[0027]

The connection portion for first extension pipe 40 and second extension pipe are drawn and described in detail, but the connection portion between second extension pipe 41 and a connection pipe 79 of a floor suction tool 54 (described later) is the same, and the description and detailed drawings are omitted.

[0028]

Floor suction tool 54 is detachably connected to the other end of second extension pipe 41. Floor suction tool 54 is constructed from the following: a suction tool body 57 that comprises an upper case 55, a lower case 56, and a lid body 68 (described later) that detachably latches onto upper case 55 and lower case 56; a pivoting pipe 75 (described later) that is sandwiched between upper case 55 and lower case 56 and can be moved up and down with respect to suction tool body 57; a connection pipe 79 (described later) that is placed on pivoting pipe 75 and can rotate freely in the circumferential direction.

[0029]

A suction opening 58 is formed on the lower surface of suction tool body 57. A rotation brush housing chamber 59 is formed inside suction tool body 57. A rotation brush 60 facing suction opening 58 is rotationally housed in rotation brush housing chamber 59.

[0030]

Rotation brush 60 is constructed from the following: a core body 61, a pair of brush bodies 62 whose base part is inserted and attached to a spiral groove formed on core body 61; a pair of blades 63 whose base part is similarly inserted and attached to the

spiral groove of core body 61. Blade 63 is molded in a curved shape from a nylon or polyethylene resin or the like.

[0031]

A motor housing chamber 100 is formed inside suction tool body 57 and adjacent to rotation brush housing chamber 59. A motor 101 is placed inside motor housing chamber 100. A belt 102 transfers the rotation of motor 101 to rotation brush 60. Referring to Figure 8, when motor 101 is operated, brush 60 is rotated in the counter-clockwise direction. Furthermore, rotation brush 60 is constructed to be rotational in the counter-clockwise direction (as seen from the view of Figure 8) by a unidirectional clutch (not shown).

[0032]

A control part housing chamber 103 is provided inside suction tool body 57 at a position opposite motor housing chamber 100. A safety switch 104 detects when the bottom surface of suction tool body 57 is facing upward. A control board 105 conducts control of motor 101, such as stopping motor 101 when safety switch 104 detects that the bottom surface of suction tool body 57 is facing upward and the like. Safety switch 104 and control board 105 are placed inside control part housing chamber 103.

[0033]

A guide part 64 is formed approximately horizontally on the front part of suction opening 58 of lower case 56. A guide member 65 is placed in a continuous manner on lower member 70 of lid body 68, described later. Guide member 65 is placed so that there are spaces between it and the front wall of lower case 56 and between it and guide part

64. Guide member 65 guides exhaust from a path 72 described later towards guide part 64.

[0034]

Furthermore, the lower end of guide member 65 acts as the discharge opening for the circulation path (path 72 that is described later) and faces guide part 64 and is adjacent to the surface to be cleaned. By having the exhaust from the circulation path (path 72) discharged from a position adjacent with the surface to be cleaned, the dust on the surface to be cleaned is easily taken in, and the cleaning effectiveness is improved.

[0035]

The exhaust that collides with guide part 64 has its direction changed and is guided towards rotation brush 60. During the cleaning of a carpet, a reduction in the rotational force due to catching of blade 63 and brush body 62 of rotation brush 60 on the carpet is prevented.

[0036]

An axle supporting part 66 is formed at the back center part of upper case 55 and lower case 56. Axle supporting part 66 pivotably supports a hollow axle 78 of pivoting pipe 75 described later. An exhaust space 67 is formed continuously on axle supporting part 66. Exhaust from motorized fan 6 is guided via hollow axle 78 of pivoting pipe 75 (described later) to exhaust space 67.

[0037]

Lid body 68 is removably attached to upper case 55 and lower case 56 and constructs the top panel of rotation brush housing chamber 59. Lid body 68 is constructed

from an upper member 69 and a lower member 70. A pair of expanded parts 71 are formed near both end portions in the longitudinal direction of upper member 69 or in other words at positions corresponding to both end portions of rotation brush 60. Expanded parts 71 are formed protruding upward over the entire width of upper member 69. Path 72 through which exhaust from exhaust space 67 passes is formed between expanded parts 71 and lower member 70. In addition, the forward opening of path 72 is the discharge opening for the exhaust.

[0038]

A plurality of small holes 73 is formed in the portion corresponding to the part between path 72 and path 72 of lower member 70. Small holes 73 reduce the noise from the air flow inside rotation brush housing chamber 59.

[0039]

Pivoting pipe 75 is provided allowing for vertical movement with respect to suction tool body 57. Pivoting pipe 75 forms a suction pipe part 76 that is continuous from one end that is connected to connection pipe 79 (described later) to the other end that is sandwiched by suction tool body 57. In addition, on the outer perimeter part of suction pipe part 76 on one end of pivoting pipe 75, an exhaust channel 77 that coincides with an exhaust path 81 of connection pipe 79 (described later) is formed.

[0040]

Hollow axle 78 is formed on the other end of pivoting pipe 75 and is in communication with exhaust channel 77. By having axle 78 be pivotably supported by axle

supporting parts 66, 66 of upper case 55 and lower case 56, exhaust channel 77 of pivoting pipe 75 and exhaust space 67 of suction tool body 57 are in communication.

[0041]

Connection pipe 79 is connected to pivoting pipe 75 in a manner allowing for pivoting in the circumferential direction. Connection pipe 79 is constructed from a suction path 80 that communicates with suction pipe part 76 of pivoting pipe 75, an exhaust path 81 that is formed unitarily on the outer perimeter of suction path 80 and that communicates with exhaust tube part 45 of second extension pipe 41, and a cover member 82 that constructs a part of exhaust path 81.

[0042]

On the side with second extension pipe 41, exhaust path 81 of connection pipe 79 has a crescent-shaped cross section coinciding with exhaust tube part 45 of second extension pipe 41. In addition, on the side of connection pipe 79 that connects with pivoting pipe 75, exhaust path 81 is formed over the entire outer perimeter of suction pipe part 76.

[0043]

As with the end part of second extension pipe 41 on the first extension pipe 40 side and with the end part of first extension pipe 40 connecting with handle pipe 33, an insertion tube part 84 is formed on connection pipe 79 on the side with second extension pipe 41. Insertion tube part 84 has a latching depression part 85 that latches with hook 48 of clamp 46.

[0044]

Terminals 106 are placed on the upper surface of connection pipe 75 on the side with second extension pipe 41. Feeder lines 107 have one end connected to terminal 106. A connector 108 connects to the other end of feeder lines 107 and is attached to control board 105. Feeder lines 107 are placed in exhaust channel 77, hollow shaft 78, and exhaust space 67 and are connected with control board 105. Furthermore, in order to prevent breaking of wire due to pivoting of pivoting pipe 75 and connection pipe 79, feeder lines 107 are wired with more slack than the distance that pivoting pipe 75 and connection pipe 79 pivot.

[0045]

By connecting connection pipe 75 to second extension pipe 41, terminal 106 is electrically connected to a feeder means (not shown) that is placed in second extension pipe 41. A cover body 109 anchors terminal 106 and covers feeder lines 107.

[0046]

A support cover 86 is attached to one end of pivoting pipe 75 and comprises an upper support member 87 and a lower support member 88. A rim part 89 that is formed at the opening edge of exhaust path 81 of connection pipe 79 is sandwiched between support cover 86 and one end of pivoting pipe 75. Support cover 86 supports pivoting pipe 75 and connection pipe 79 in a freely pivoting manner.

[0047]

Pivoting pipe 75 can be pivoted to a position that is approximately perpendicular with respect to suction tool body 57. In addition, connection pipe 79 can be pivoted in the left-right direction with respect to pivoting pipe 75 to a position approximately horizontal

with the floor surface. By pivoting pivoting pipe 75 to the perpendicular position as well as pivoting connection pipe 79 left or right to an approximately horizontal position, first extension pipe 40 and second extension pipe 41 become roughly parallel with respect to suction tool body 57. Suction tool body 57 can penetrate and clean between furniture and the like.

[0048]

Therefore, with the embodiment of the present invention, when motorized fan 6 is operated, air containing dust is sucked in from suction opening 58 of floor suction tool 54 and a guide opening 74. This air flows into dust collecting chamber 5 via suction pipe part 76 of pivoting pipe 75, suction path 80 of connection pipe 79, suction tube part 42 and suction tube part 43 of first extension pipe 40 and second extension pipe 41, inner tubular part 35 of handle pipe 33, inner member 31 and inner hose 25 of second connection member 30, inner member 28 of first connection member 27.

[0049]

After filtering the dust contained in the suction air by paper pack 4, a large portion of the suction air is circulated as exhaust from the fan portion of motorized fan 6 to exhaust path 17 via first opening 11 of motor cover 10 and return opening 15 of motorized fan housing chamber bottom surface. In addition, a portion of the suction air from the motor part of motorized fan 6 is discharged from the axle portion of wheel 14 via second opening 12 of motor cover 10 and filter 13.

[0050]

A large portion of the exhaust circulated to exhaust path 17 flows between inner member 28 and outer member 29 of first connection member 27 via communication hole 23 formed on partitioning wall 22 of body case 2, exhaust space 19 between body case 2 and front cover 18, communication opening 21 formed on hose connection tube part 20 of front cover 18.

[0051]

After passing through an exhaust path formed between inner hose 25 and outer hose 26 that are each connected to inner member 28 and outer member 29 of first connection member 27, the exhaust flows inside outer tubular part 36 of handle pipe 33 via the space between inner member 31 and outer member 32 of second connection member 30. The exhaust further flows into exhaust path 81 of connection pipe 79 of floor suction tool 54 via exhaust tube part 44 and exhaust tube part 45 of first extension pipe 40 and second extension pipe 41.

[0052]

The exhaust that flows into exhaust path 81 of connection pipe 79 goes from exhaust channel 77 of pivoting pipe 75 via hollow shaft 78 and goes through exhaust space 67 of suction tool body 57 and collides with guide part 64 via path 72 formed on expanded parts 71 of lid body 68. The exhaust is blown towards rotation brush 60 and rotates rotation brush 60.

[0053]

Furthermore, because guide member 65 is continuous with lower member 70 of lid body 68 that constructs path 72 and is placed adjoining guide part 64, the exhaust from

path 72 is prevented from being dispersed inside rotation brush housing chamber 59. The exhaust is more accurately guided to rotation brush 60, and rotational force of rotation brush 60 is efficiently obtained.

[0054]

When cleaning a carpet with long fibers and the like, there is insufficient rotation torque with just the rotational force of rotation brush 60 from the exhaust circulated to suction tool body 57. Dust embedded deep inside the fibers of the carpet and the like may not be sufficiently removed. With this situation, motor 101 is operated, and rotation brush 60 is forcibly rotated. When this occurs, the exhaust that collides with guide part 64 has its direction changed, and is guided in the direction of the rotation of rotation brush 60. This aids in the rotation of rotation brush 60 and reduces the load on motor 101. In addition, motor 101 can be made smaller.

[0055]

Furthermore, feeder lines 107 to control board 105 are placed in exhaust channel 77, hollow axle 78, and exhaust space 67. As a result, wiring can be conducted without using special parts. The construction can be simplified. In addition, because feeder lines 107 are placed in exhaust channel 77, hollow axle 78, and exhaust space 67, where air that has passed through paper pack 4 and is relatively clean is flowing, damage to coverings or short circuits of feeder lines 107 arising from collision with dust and the like are prevented, and clogging of paths due to trapping of dust and the like on feeder lines 107 is prevented.

[0056]

Clamps 46, which are placed in the connection parts between handle pipe 33 and first extension pipe 40, between first extension pipe 40 and second extension pipe 41, and between second extension pipe 41 and connection pipe 79 of floor suction tool 54, are provided on the side with the path of suction from floor suction tool 54 to vacuum cleaner body 1. As a result, air does not flow out to the atmosphere from the hole where the pushing part of clamp 46 is facing out. The user does not feel any discomfort.

[0057]

In other words, using the connection portion between first extension pipe 40 and second extension pipe 41 as an example, if pushing part 47 of clamp 46 were placed on the side with exhaust tube 44, exhaust flowing inside exhaust tube part 44 can leak to the outside of first extension pipe 40 via opening 49 where hook 48 of clamp 46 faces out. The user may feel some discomfort. However, in the present embodiment, clamp 46 is placed on the side with suction tube part 42, which is the suction path from floor suction tool 54 to vacuum cleaner body 1. As a result, due to the suction flow that is inside suction tube part 42 and flows by being sucked in by motorized fan 6, outside air is sucked inside suction tube part 42 via opening 49 where hook 48 of clamp 46 faces out. Leakage of air from first extension pipe 40 is prevented, and the user does not experience any discomfort.

[0058]

Furthermore, in motor 101, safety switch 104 detects when the bottom surface of suction tool body 57 faces upward, and the control part stops motor 101. As a result, injury from touching rotation brush 60 with the hand is prevented.

[0059]

Path 72 of lid body 68 is formed at a position corresponding to both ends of rotation brush 60. As a result, the exhaust circulating in path 72 is blown mainly onto both ends of rotation brush 60 via guide part 64.

[0060]

The suctioning force of the vacuum cleaner is strongest at the center part of suction opening 58, corresponding to suction pipe part 76 of pivoting pipe 75 that is connected to the back center part of suction tool body 57. However, in the present embodiment as described above, because exhaust is blown at both ends of rotation brush 60, dust at both ends of rotation brush 60, where the suction force is relatively weak compared to the center part of suction opening 58, can be reliably stirred up.

[0061]

Furthermore, because the discharge opening for path 72 is formed towards the front of floor suction tool 54 (in other words, on the front side of rotation brush housing chamber 59), the exhaust that flows from the back towards the front of floor suction tool 54 is guided smoothly from the front of rotation brush housing chamber 59, around towards the bottom, and then towards the back. Therefore, reduction of wind speed is prevented, and the suctioning force for deep parts can be improved.

[0062]

The discharge opening of path 72 is provided with guide member 65, and the discharge opening for the exhaust from path 72 is close to the surface to be cleaned. As a result, the exhaust from path 72 is aligned and blown onto guide part 64. Reduction in

wind speed is prevented, and rotational torque of rotation brush 60 is reliably obtained. In addition, dust from the surface to be cleaned is churned up, and the suctioning performance can be improved.

[0063]

[Advantages of the invention]

According to the construction described in Claim 1 of the present invention, by placing the feeder lines to the motor that rotates the rotation brush in the circulation path that circulates in the floor suction tool, the construction of the floor suction tool can be simplified.

[0064]

Furthermore, because the feeder lines are wired in the circulation path where the air flow is relatively clean, damage to the coating due to collisions of the feeder lines with dust and the like is prevented, and short circuiting of the feeder lines are prevented. In addition, clogging of the channels due to trapping of dust and the like on the feeder lines is prevented.

[0065]

According to the construction described in Claim 2 of the present invention, because the amount of slack in the feeder lines is greater than the pivoting distance of the pivoting pipe and the connection pipe, breaking of the wires of the feeder lines due to pivoting of the pivoting pipe and connection pipe is prevented.

[0066]

According to the construction described in Claim 3 of the present invention, the exhaust air circulating in the floor suction tool is guided in the direction of the rotation of the rotation brush. As a result, the exhaust air aids in driving the rotation brush when the motor is operated, and it can decrease the load on the motor, and the motor can be made smaller.

[Brief description of the figures]

[Figure 1] A cross-section of a vacuum cleaner body and flexible hose of a vacuum cleaner of the present invention.

[Figure 2] A cross-section of the same flexible hose from a handle pipe to a floor suction tool.

[Figure 3] A top view of the same floor suction tool.

[Figure 4] A side view of the same.

[Figure 5] A front view of the same.

[Figure 6] A top view of the same floor suction tool when an upper case and lid body are removed.

[Figure 7] A cross-section of the same floor suction tool.

[Figure 8] A cross-section along line A-A of Figure 3.

[Figure 9] A front view of the same pivoting pipe and connection pipe.

[Figure 10] A side view of the same.

[Figure 11] A figure simultaneously showing a rear view when the same pivoting pipe and connection pipe are connected and the back side of the pivoting pipe.

[Figure 12] A cross-section of the same pivoting pipe and connection pipe.

[Figure 13] A cross-section along line B-B of Figure 12.

[Figure 14] A cross-section along line C-C of Figure 12.

[Figure 15] A cross-section along line D-D of Figure 12 with the pivoting pipe removed.

[Figure 16] A top view of the same connection pipe.

[Figure 17] A bottom view of the same connection pipe.

[Figure 18] A cross-section of the connection portion of first extension pipe and second extension pipe.

[Figure 19] A cross-section along line E-E of Figure 18.

[Description of the numerals]

1 vacuum cleaner body

24 hose

25 inner hose

26 outer hose

40 first extension pipe

41 second extension pipe

42 suction tube part

43 suction tube part

44 exhaust tube part (circulation path)

45 exhaust tube part (circulation path)

54 floor suction tool

60 rotation brush

64 guide part

65 guide member

67 exhaust space (circulation path)

72 path (circulation path)

74 guide opening

75 pivoting pipe

76 suction tube part

77 exhaust channel (circulation path)

78 hollow axle

79 connection pipe

80 suction path

81 exhaust path (circulation path)

101 motor

107 feeder wire

[Document name] Abstract

[Abstract]

[Object]

The object of the present invention is to provide an electric vacuum cleaner that simplifies the construction of a floor suction tool and also improves the dust removing performance.

[Means for solving]

In an electric vacuum cleaner, exhaust from a motorized fan 6 inside a vacuum cleaner body 1 is circulated to a floor suction tool 54 via a hose 24, an extension pipe 40 and an extension pipe 41. A rotation brush 60 and a motor 101 that drives rotation brush 60 are provided in floor suction tool 54. Feeder lines 107 to motor 101 are wired in circulation path 77, circulation path 78 and circulation path 68.

[Selected figure] Figure 7